

Stevens Institute of Technology
Department of Electrical and Computer Engineering

Spring Semester 2025

CpE 462 Introduction to Image Processing

Homework 3: Due Feb. 27.

3.1 (1A) Given:

$$\mathbf{x}_1[\mathbf{n}] = \delta[\mathbf{n}] - 2\delta[\mathbf{n} - 1]$$

$$\mathbf{x}_2[\mathbf{n}] = 2\delta[\mathbf{n}] + \delta[\mathbf{n} - 1] - \delta[\mathbf{n} - 2]$$

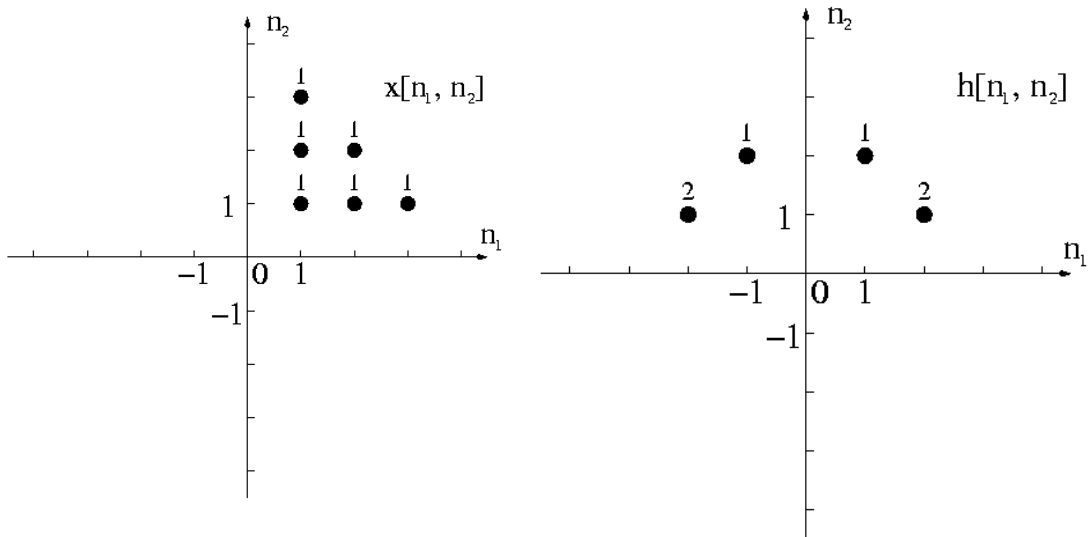
3.1.1 Compute the linear convolution $\mathbf{x}_1[\mathbf{n}] * \mathbf{x}_2[\mathbf{n}]$

3.1.2 Compute 4-point DFT: $\mathbf{X}_1[\mathbf{k}] = \text{DFT}\{\mathbf{x}_1[\mathbf{n}]\}$ and $\mathbf{X}_2[\mathbf{k}] = \text{DFT}\{\mathbf{x}_2[\mathbf{n}]\}$.

Note:

- DFT should be computed in numbers, not in W_N^{nk} .
- You can use Matlab to calculate these W_N^{nk} .
- Show all your steps.

3.2 (1A) Calculate the 2-D convolution $\mathbf{x}[\mathbf{n}, \mathbf{n}] ** \mathbf{h}[\mathbf{n}, \mathbf{n}]$, show all the necessary intermediate steps.



3.3 (5E) Each project group submits a 1-page project proposal, which should include

- The problem to solve.
 - Do not try to save the world. Think of something feasible.
- Your approach to solve this problem.
 - The knowledge you are going to learn by yourselves. Don't wait until I cover the topic in class.
- The tools you are going to use.
 - Let me know if you need help.
- The detailed tasks of each group member.